



Bellcomm

955 L'Enfant Plaza North, S.W.
Washington, D. C. 20024

date: April 30, 1971

to: Distribution

from: A. B. Baker

B71 04059

subject: The Automated Task Scheduler/Version 2 - Case 610

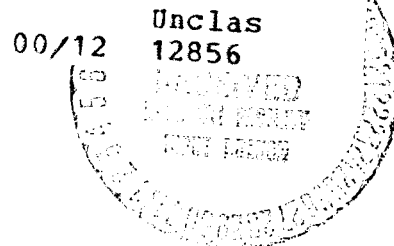
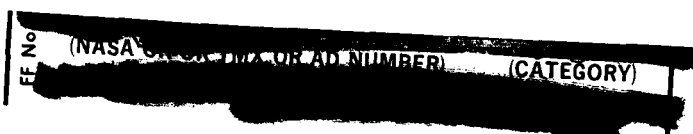
ABSTRACT

This memorandum describes improvements made to the original version of the Automated Task Scheduler (ATS) System, a group of computer programs designed to produce and display timelines of in-flight activities for manned space missions. The changes increase the operational flexibility of the programs as well as the information content of their outputs. The basic computational algorithms were left unchanged.

Modifications to the Schedule Generator Program include (1) the incorporation of a set of diagnostics that indicate why tasks were not scheduled and (2) the expansion of the input data options to permit new variables to be defined when the program is initialized at intermediate points in the scheduling process. The primary change to the Data Processor was the modification of the input structure to accept ephemeris data directly from the ATS Ephemeris Tape. This permits the plotting capabilities of the program to be used to plot ephemeris data alone or ephemeris data combined with scheduling data from the ATS History Tape.

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MEMORANDUM FOR FILE

1.0 Introduction

A revised version of the Automated Task Scheduler (ATS) has replaced the system described in Reference 1. The new system contains modified versions of the three original programs (the Data Bank Generator, the Schedule Generator, and the Data Processor) and a new program, the Interactive Schedule Generator (ISG). The ISG is designed as a functional replacement for the Schedule Generator and is used in a conversational mode from the computer terminals.

This memorandum describes changes to the original programs and structural changes to the permanent data files generated by the ATS programs.* The reader should note that the text assumes a familiarity with the ATS Systems Manual (Reference 1).

2.0 Structural Changes to the Permanent Data Files

2.1 File Identifiers

All permanent data files (i.e., Task Data Banks, ATS Ephemeris Tapes, and History Tapes) generated by programs in the ATS system now contain unique identifiers or serial numbers to facilitate distinguishing different files of the same type. Each identifier consists of two six-digit numbers representing the date (month, day of the month, and the last two digits of the year) and time (hours, minutes, and seconds) that the file was generated. The numbers are obtained from the computer system executive. Identifiers for every data file used in a particular run are printed out as part of the initialization data for that run.

*The ISG will be described in a separate memorandum.



2.2 History Tape Format

The format of the History Tape has been completely restructured in order to

- a. Eliminate the large amounts of redundant information inherent in the original format, and
- b. Adapt the tape structure to the particular needs of the ISG.

The resulting structure permits a History Tape generated either by the Schedule Generator or the ISG to be used as an input to the Schedule Generator, the Data Processor, or the ISG.

In the original format, a complete set of data records describing the status of the schedule is written onto the History Tape at every task priority level. As shown in Figure 7.2 of Reference 1, each set of records contains all of the start-time lists for the tasks already scheduled as well as a complete set of Resource Commitment Tables. Since a set of records is written at each task priority level, the value of the task priority level indicator is used as a unique identifier for the History Tape record sets. Whenever a set of records is written onto the History Tape, the current value of the task priority level indicator is written out in the first record of the set. Then, during subsequent initializations from that tape, the task priority level indicator is used to select the desired record set.*

In the new format, record sets are only written at those task priority levels where scheduling decisions have been made. When no tasks are found at a particular task priority level, no records are written for that level. When scheduling decisions are made, start-time lists for the tasks that were considered at that priority level are written onto the tape. Each list either contains start-times for the task or information indicating why the task was not scheduled (Section 3.2.1). All commitment tables that were modified in the course of scheduling tasks at that priority level are also written onto the tape.

As a result of this structure, initialization from the History Tape is now a cumulative process; i.e., data on successive record sets adds to or modifies data read from

*Reference 1 - Section 7.2.



previous record sets. The process continues until the data on the designated record set is read in. At this point the schedule is initialized to the desired intermediate point.

Each record set in the new format is also assigned a unique number; however, that number is separate and distinct from the value of the task priority level indicator. Instead, a record set number counter (FORTRAN variable IPRIOR) is incremented by one whenever a record set is placed on the tape and the current value of the counter is written out in the first record of the set. To correlate the record set number with the data stored on that record set, the current value of the counter is printed out along with the names of the tasks whose scheduling information (start-time lists and updated commitment tables) appears on that record set. In addition, the appropriate record set number for each task is stored in the L NAMES array along with the task name and priority. The contents of the array are printed out at the completion of the schedule.

For subsequent initializations from the History Tape, the user must specify, via input variable NREC, the number of the last record set to be included in the initialization. If NREC is omitted from the Schedule Generator input data, the program will assume that a new schedule is to be generated.

3.0 Program Changes

The latest versions of the Data Bank Generator and Schedule Generator programs are located on FASTRAND file ATS*SCHEDULER2. The new version of the Data Processor program is located on file ATS*PROCESSOR2. A majority of the changes to the three programs affect the composition of the job decks and/or data decks. Each of the tables in the sections below that illustrate the new job decks, data definitions, and input data alternatives is intended to replace a specific table in Section 9 of Reference 1. A chart defining these replacements is presented in Table 3.1.

One change common to all three job decks (Tables 3.2, 3.4, and 3.7) is the replacement of the four control cards defining the auxiliary drum files required for the Task Annotation and Descriptor Lists with a single ADD statement. The control cards defining all of the required temporary files are now stored on card file element FILES and are added to the run stream with the ADD statement.



Table 3.1

Table Replacements for the ATS Systems Manual

<u>Original Table #</u> (Reference 1)	<u>Replacement Table #</u>
9.1	3.2
9.2	3.4
9.3	3.5
9.4 and 9.5	3.6
9.8	3.7
9.9	3.8
9.10	3.9



3.1 The Data Bank Generator

The job deck for the Data Bank Generator is shown in Table 3.2. No changes, other than those discussed in paragraph 3.0, were made to the program structure or operating characteristics. These are described in Reference 1, Sections 6.0 and 9.1 respectively.

3.2 The Schedule Generator

The primary modification to the Schedule Generator was the incorporation of a set of diagnostics to indicate reasons why tasks were not scheduled. In addition, the program's input and output options were expanded to increase its operational flexibility. All of these modifications are described below.

3.2.1 Diagnostics for Unscheduled Tasks

As described in Reference 1, Section 7.1, the name of each task along with the address of its corresponding list of start-times is entered in Array ORDER after the task has been processed by the Window-Finder and Scheduler Areas. If no performances are scheduled, a zero is entered in place of the list address. In the new version of the program, the zero is replaced with the address of a list containing data which indicates why the task was not scheduled. The structure of such a list is shown in Figure 3.1. The element field of the first cell on the sublist contains an identifier (the alphanumeric characters INONE) which indicates that no start-times were determined. The element field of the second cell on the sublist contains a Reason Key, i.e. an integer k ($1 \leq k \leq 10$) which represents a key to the reason that the task was not scheduled. The reasons corresponding to the possible values of k are listed in Table 3.3. The texts are shown exactly as they are printed out by the ATS programs. Note that some of the reasons require an alphanumeric name. If required, that name would be stored in a third cell on the sublist.

The precise meanings of the messages in Table 3.3 are discussed in Appendix A. It should be noted that in the original version of the program, execution of the run was terminated whenever reasons 2, 9, or 10 occurred. In the new version, none of the reasons will cause an error termination. The run will continue until all of the tasks have been considered.



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Table 3.2

Job Deck for the ATS Data Bank Generator

```
@RUN                ABBJOB, ABB, ATS, 30, 200
@HDG                JOB DECK FOR ATS DATA BANK GENERATOR
@ASG,A              SCHEDULER2
@ASG,A              DATABANK
@USE                2,DATABANK
@ADD                SCHEDULER2.FILES
@XQT                ATS*SCHEDULER2.BNKMAP
$INPUT
                    [NAMELIST Variables]
$END
                    [Task Description Cards]
LAST
@FIN
```

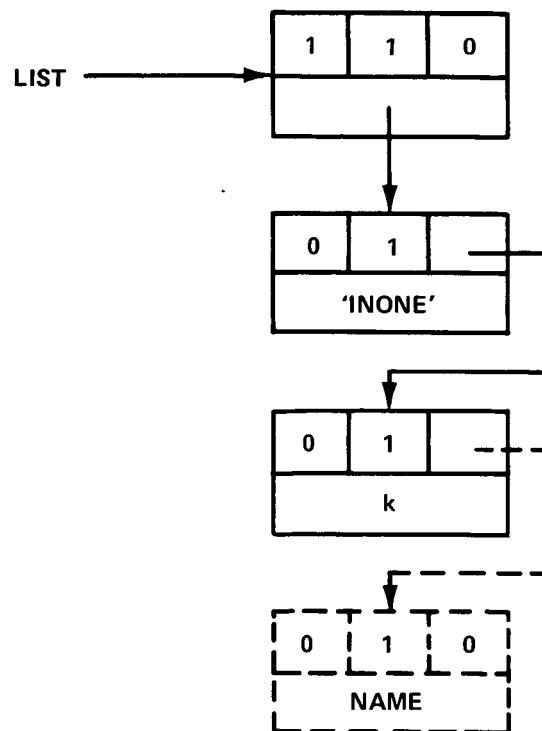


FIGURE 3.1 - START-TIME LIST FOR TASKS THAT COULD NOT BE SCHEDULED



Table 3.3

Reasons for Not Scheduling a Candidate Task*

<u>Reason Key</u>	<u>Reason</u>
1	INSUFFICIENT AMOUNT OF CONSUMABLE 'RESNME'
2	INDEPENDENT TASK 'TASKX' NOT YET CONSIDERED
3	NO PERFORMANCES OF INDEPENDENT TASK 'TASKX'
4	MAXIMUM # OF SCHEDULABLE PERFORMANCES (k) WAS LESS THAN THE REQUIRED MINIMUM
5	CREW REQUIREMENTS COULD NOT BE SATISFIED
6	NO START-TIME WINDOWS COULD BE FOUND
7	USERS CHOICE
8	ZERO PERFORMANCES SPECIFIED
9	RESOURCE 'RESNME' WAS NOT DEFINED
10	CONSUMABLE 'RESNME' WAS NOT DEFINED

*The lower case letter k and names appearing inside quotation marks are inserted for purposes of illustration. They will be replaced by actual data in the computer print-out.



3.2.2 Schedule Generator Job Deck

The structure of the job deck for the Schedule Generator is shown in Table 3.4 and the variables included in the program's input NAMELIST statement are defined in Table 3.5. The overall structure of the job deck is identical to its counterpart in Reference 1; however, the permissible options in the NAMELIST portion of the data deck have been significantly expanded. The options are shown in Table 3.6.

The new version of the Schedule Generator permits the addition of new data (e.g., Resource and Ephemeris Commitment Tables, consumables, or task descriptions from a data bank) regardless of what type of initialization (for the generation of a new schedule or for the completion of a partial schedule) is performed. In fact, as shown in Table 3.6, any combination of data options can be specified with either type of initialization. The data options are explained below.

3.2.2.1 Type of Initialization

The type of initialization is indicated by which of two variables is specified in the input data. If the variable TOTIME is specified, a new schedule will be generated with a total mission duration equal to the value of TOTIME. If the variable NREC is specified, the program is to be initialized from a History Tape and the resulting partial schedule is to be completed.

3.2.2.2 Data Bank Option

Three data bank options are provided to minimize the number of individual task names that have to be specified in the data deck. Normally, Array INCLUD contains the names of all of the tasks whose descriptions are to be copied from the permanent Data Bank. If all of the descriptions in the bank are to be used, the user may set INCLUD equal to 'ALL' rather than specify each task name separately. If all but a few tasks are to be used, the user may alternately specify the names of those tasks to be omitted in Array IGNORE.

3.2.2.3 Ephemeris Data Option

The Ephemeris Resource Tables whose names are specified in Array EPHEM will be copied from the ATS Ephemeris Tape. (If all of the tables on the tape are to be copied, the user may



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Table 3.4

Job Deck for the ATS Schedule Generator

```
@RUN      ATSJOB, ABB, ATS, 30, 200

@HDG      JOB DECK FOR THE ATS SCHEDULE GENERATOR

@ASG,A    SCHEDULER2

@ASG,TM    2,T,xxxx (assign input Data Bank tape and relate
                  it to logical unit 2)*

@ASG,TM    4,T,xxxx (assign Ephemeris Tape and relate it
                  to logical unit 4)*

@ASG,TM    8,T,xxxx (assign input History Tape and relate
                  it to logical unit 8)*

@ASG,TM    9,T,xxxxR (assign output History Tape and relate
                  it to logical unit 9)*

@ASG,TM    14,T,xxxxR (assign output Data Bank Tape and
                  relate it to logical unit 14)*

@ADD      SCHEDULER2.FILES

@XQT      ATS*SCHEDULER2.SCDMAP

$INPUT

                  [NAMELIST Variables]

$END

                  [Task Description Cards]

LAST

@FIN
```

*Note: xxxx denotes the reel number of the particular magnetic tape.

Table 3.5

Variables Included in the Schedule Generator NAMELIST Statement

FORTRAN Variable	Dimension	Data Format	Definition
EPHEM	(17)	Hollerith	Array containing the names of the Ephemeris Resource Tables that are to be obtained from the ATS Ephemeris Tape.
IBANK	(1)	Integer	Output Data Bank Flag, 0:NO, 1:YES.
IGNORE	(200)	Hollerith	Array containing the names of the tasks whose descriptions are <u>not</u> to be transferred from the Permanent Data Bank.
INCLUD	(200)	Hollerith	Array containing the names of the tasks whose descriptions are to be obtained from the Permanent Data Bank.
IPRINT	(1)	Integer	Print Frequency Flag.
ITABLE	(1)	Integer	Start-time window table flag, 0:NO, 1:YES.
ITAPE	(1)	Integer	History Tape output flag, 0:YES, 1:NO.
LBANK	(1)	Integer	Task Description Print flag, 0:NO, 1:YES.
LEPHEM	(1)	Integer	Ephemeris Data Print flag, 0:NO, 1:YES.
NCRENT	(1)	Integer	Maximum number of entries in each crew commitment table.
NEWCOM	(3,20)	(1,X) Hollerith (2,X) Integer (3,X) Integer	Array containing the name, type, and maximum # of permissible entries of every required Resource Commitment Table except those for crewmen (maximum of 17)

Table 3.5 (Continued)

FORTRAN Variable	Dimension	Data Format	Definition
NEWCRW	(2,5)	Hollerith	Array containing the name and associated skill of each crewman (maximum of 5).
NEWDAT	(3,10)	(1,X) Hollerith (2,X) Floating Point (3,X) Floating Point	Array containing the name, initial quantity, and maximum usage rate of each consumable (maximum of 10).
NREC	(1)	Integer	History Record Set Number
TOTIME	(1)	Floating Point	Total mission time (days)

Table 3.6

Schedule Generator Data Specification Options

Type of Initialization (Specify One)

TOTIME = 26.0,

or

NREC = 10,

A new schedule is to be generated for a mission having a duration of 26.0 days

Initialize the scheduling process from an input History Tape. Initialize to the status determined by the first 10 History Tape record sets.

Input Data Options

1. Data Bank

INCLUD = 'TASKA', 'TASKB',
'TASKC',

Descriptions of the specified tasks will be copied from the permanent Data Bank.

or

INCLUD = 'ALL',

Descriptions of all tasks in the permanent Data Bank will be copied.

or

IGNORE = 'TASKW', 'TASKX',
'TASKY',

Descriptions of all tasks except those specified will be copied from the permanent Data Bank.

Table 3.6 (Continued)

2. Ephemeris Tables

EPHEM = 'TABLEA', 'TABLEB',

or

EPHEM = 'ALL',

The specified Ephemeris Resource Tables will be copied from the ATS Ephemeris Tape.

All Ephemeris Resource Tables on the ATS Ephemeris Tape will be copied.

3. New Resource Commitment Tables

NEWCOM = 'POWER', 150, 2,

A Resource Commitment Table for an analog resource named POWER is to be established with a maximum of 150 entries.

NEWCRW = 'CREWD', 'NONE', 'CREWC',
'DOCTOR',

Resource Commitment Tables for crewman CREWD are to be established. Crewman CREWD will have no specific skill. Crewman CREWC is to be assigned the skill of DOCTOR.

NCRENT = 300,

Resource Commitment Tables for all crewmen are permitted a maximum of 300 entries.

4. New Consumables

NEWDAT = 'OXYGEN', 5000.0, 0.0,
'POWER', 0.0, 4000.0,

Two consumables named OXYGEN and POWER are to be tracked. OXYGEN has an initial amount of 5000.0 available and an unspecified usage rate (designated by 0.0). POWER has a unspecified amount available (designated by 0.0) and a maximum usage rate of 4000.0.

Table 3.6 (Continued)

Output Data Options

1. Data Bank

IBANK = 1,

A Data Bank consisting of all of the task descriptions in the present scheduler run will be created.

2. History Tape

ITAPE = 1,

No output History Tape will be generated.

3. Print Options

IPRINT = 4,

All of the resource commitment tables are to be printed out every four priority levels.

ITABLE = 1,

A table showing the duration of start-time windows is to be printed.

LBANK = 1,

The descriptions of all of the tasks in the present scheduler run will be printed out.

LEPHEM = 1,

All Ephemeris Resource tables will be printed out.



alternately set EPHEM equal to 'ALL'.) The names specified in Array EPHEM must exactly match their counterparts on the Ephemeris Tape in order for the corresponding tables to be copied. A diagnostic message containing the names in Array EPHEM that could not be matched with names on the Ephemeris Tape will be printed out as part of the initialization data (Appendix B - Section B.1).

3.2.2.4 Specification of Resource Commitment Tables

A discussion describing the specification of Resource Commitment Tables appears in Section 9.2.1.4 of Reference 1. That discussion remains valid for the new version of the program with one additional note of caution: once defined, the characteristics (type of table and maximum number of entries) of a resource commitment table cannot be changed. Any attempt to redefine the characteristics of a table on a subsequent run will terminate that run with an error message (Appendix B - Section B.2). The same holds true for crew skills. A crewman may be assigned a particular skill when the name of the crewman is first defined. Any attempt to redefine the skills on a subsequent run will also terminate the run with an error message (Appendix B - Section B.3).

3.2.2.5 Specification of Consumable Limits

A discussion describing the specification of consumable limits appears in Section 9.2.1.5 of Reference 1. That discussion also remains valid for the new version of the program with the same additional condition noted in the previous paragraph: once defined, consumable limits cannot be redefined. Any attempt to redefine the limits of existing consumables will terminate the run with an error message (Appendix B - Section B.4).

3.2.2.6 Output Data Bank Option

When the variable IBANK is set equal to one, a new permanent Data Bank will be created by copying all of the task descriptions stored on the auxiliary storage files onto a magnetic tape or FASTRAND file. The bank is created after all of the edits to the task descriptions have been completed so that the new bank will contain the final versions of all of the task descriptions used in that run. Note that the bank will be created on logical unit 14 and so a tape or FASTRAND file must be assigned to that unit whenever this option is used (Table 3.4).



3.2.2.7 History Tape Option

Only one option is available. If no output History Tape is to be generated, the variable ITAPE is set equal to one.

3.2.2.8 Print Options

Four print options are available:

- a. The Print Frequency Flag IPRINT is used to control the printing of intermediate results. When the flag is set equal to k, the program will print out the contents of all resource commitment tables every k priority levels. If IPRINT is not specified, only the final results will be printed.
- b. The variable ITABLE is used to control the printing of a table that illustrates the calculation of start-time windows for each task. This option is usually used only for detailed analyses of particular problems since it results in a large volume of print-out.
- c. The variable LBANK is used to control the printing of the temporary Task Data Bank. When LBANK is set equal to one, all of the task descriptions stored on the auxiliary storage files are printed out after all edits to the descriptions have been completed.
- d. The variable LEPHEM controls the printing of the Ephemeris Resource Tables. When LEPHEM is set equal to one, all of the Ephemeris Resource Tables are printed out as part of the initialization data.

3.3 The Data Processor

The structure of the Data Processor program was modified to accept ephemeris information directly from the ATS Ephemeris Tape. The program can now be used to plot any combination of variables from the History and Ephemeris Tapes subject to the operating rules discussed in Section 9.3 of Reference 1. A sample job deck for the new version of the program is illustrated in Table 3.7 while Table 3.8 defines



Table 3.7

Job Deck for the ATS Data Processor

```
@RUN          ABBPLT, ABB, ATS, 30, 200
@HDG          JOB DECK FOR THE ATS DATA PROCESSOR
@ASG,A        PROCESSOR2
@ASG,TM       4,T,xxxx      (assign Ephemeris Tape and relate
                           it to logical unit 4)*
@ASG,TM       8,T,xxxx      (assign input History Tape and
                           relate it to the logical unit 8)*
@ASG,TM       PLOTFILE.,T,PLOT    (assign output plot tape)
@ADD          PROCESSOR2.FILES
@XQT          ATS*PROCESSOR2.PLTMAP

$INPUT

                           [NAMELIST Variables]

$END

$INPUT

                           [NAMELIST Variables]

$END

@XQT          ATS*PROCESSOR2.PHASE2
@FIN
```

*Note: xxxx denotes the reel number of the particular magnetic tape.

Table 3.8

Variables Included in the Data Processor NAMELIST Statement

FORTAN Variable	Dimension	Data Format	Definition
EPHEM	(17)	Hollerith	Array containing the names of the Ephemeris Resource Tables that are to be obtained from the ATS Ephemeris Tape.
HDEP	(5)	Hollerith	Array containing the names of the variables to be included on a coaxial (horizontal) graph (maximum of five).
KDUMP	(1)	Integer	Flag to control the printing out of all collected data. 0:NO, 1:YES.
LAST	(1)	Integer	Flag indicating the last plot request.
LBANK	(1)	Integer	Task Description Print Flag 0:NO, 1:YES.
LEPHEM	(1)	Integer	Ephemeris Data Print Flag, 0:NO, 1:YES.
LPF	(1)	Integer	Number of time intervals (lines) to be placed on one frame.
NREC	(1)	Integer	History Record Set Number.
RPF	(1)	Floating Point	Length of the time interval to be displayed on one frame (days).
RPL	(1)	Floating Point	Length of one time interval (days).

Table 3.8 (Continued)

FORTRAN Variable	Dimension	Data Format		Definition
		Floating Point	Floating Point	
TBEGIN	(1)			Lower endpoint of the plot interval (days).
TEND	(1)			Upper endpoint of the plot interval (days).
TITLE	(8)	Hollerith		Array containing the 48 alphanumeric characters to be used as the plot title.
VGRID	(1)	Integer		Grid Indicator Flag for periodic plots: 0:YES, 1:NO.
VSHADE	(3)	Hollerith		Array containing the names of the variables whose occurrences are to be represented as shaded boxes on a period plot (maximum of 3).
VPOINT	(15)	Hollerith		Array containing the names of the variables whose occurrences are to be represented as points on a periodic plot (maximum of 15).



all of the variables included in the input NAMELIST. Finally, Table 3.9 illustrates the available data specification options. These options are identical to those in the original program except for the additional ephemeris data option and two additional print options.

3.3.1 Ephemeris Data Option

Ephemeris information is input to the Data Processor in exactly the same way as it is input to the Schedule Generator. Thus, when ephemeris data is to be input from the Ephemeris Tape, the tape must be assigned to logical unit 4 (Table 3.7) and the names of the desired tables must be specified in Araay EPHEM as described in Section 3.2.2.3.

3.3.2 Print Options

Two additional print options have been added. When variable LBANK is set equal to one, all of the task descriptions that were input from the History Tape will be printed out. Similarly, when variable LEPHEM is set equal to one, all of the Ephemeris Resource Tables will be printed out.

4.0 Summary

An updated version of the Automated Task Scheduler is now available. The new version contains changes to the Schedule Generator and Data Processor programs as well as to the formats of the permanent data files (the Data Bank, the History Tape, and ATS Ephemeris Tape).

All of the permanent data files now contain a unique identifier, i.e., two six-digit numbers obtained by the computer executive, which represent the date and time that the file was generated. In addition, the format of the History Tape has been completely restructured. In the new format, information is written in record sets and only at task priority levels where scheduling decisions have been made. Each record set is assigned a unique number which is separate and distinct from the value of the task priority level indicator. Subsequent initialization from the History Tape is performed by specifying the highest record set number on the tape to be included in the initialization.

A set of diagnostics was incorporated into the Schedule Generator to indicate why tasks were not scheduled. The program's input data specification options were also revised and significantly expanded. Key changes include the addition of capabilities to

Table 3.9:

Data Processor NAMELIST Specification Options

Initialization

* NREC = 10,

Initialize from the History Tape to the schedule status determined by the first 10 History Record Sets.

Ephemeris

EPHEM = 'TABLEA', 'TABLEB',

The specified Ephemeris Resource Tables will be copied from the ATS Ephemeris Tape.

or

EPHEM = 'ALL',

All Ephemeris Resource Tables on the ATS Ephemeris Tape will be copied.

Plot Interval

TBEGIN = 1.0,

All points between 1.0 and 2.0 days are to be plotted.

TEND = 2.0,

Graph Label

* TITLE = 'GRAPH TITLE WITH A MAXIMUM OF 48 CHARACTERS',

The title 'GRAPH TITLE WITH A MAXIMUM OF 48 CHARACTERS' is to be printed out across the top of every frame of the graph.

*Value is retained until redefined.

Table 3.9 (Continued)

Coaxial Plot Variables

HDEP = 'CREWA', 'TASKX', 'POWER',

Data for the variables named CREWA, TASKX, and POWER are to be plotted on a coaxial graph.

RPF = 1.0,

The coaxial graph is to be plotted to a horizontal scale of 1.0 days per frame.

Periodic Plot Variables

VPOINT = 'TASKX',

Occurrences of the variable TASKX are to be plotted as points in a periodic plot.

VSHADE = 'CREWA',

Occurrences of the variable CREWA are to be plotted as shaded boxes on a periodic plot.

RPL = 2.0,

One time interval (line) on a periodic plot is to represent 2.0 days.

* LPF = 10,

10 time intervals (lines) are to appear on one frame of a periodic plot.

* VGRID = 1,

Grid lines on the periodic plot are to be suppressed.

*Value is retained until redefined.

Table 3.9 (Continued)

Print Options

* KDUMP = 1,
LBANK = 1,
LEPHEM = 1,

All collected data is to be printed out.
All task descriptions will be printed out.
All Ephemeris Resource Tables will be printed out.

Program Control

LAST = 1,

This is the last plot request.

*Value is retained until redefined.



- a. Define new data (e.g. resource and ephemeris commitment tables, consumables, or task descriptions from a Data Bank) after the program has been initialized to some intermediate point in the scheduling process.
- b. Read selective tables from the ATS Ephemeris Tape.
- c. Create a new Data Bank with the task descriptions being used by the Schedule Generator.
- d. List all of the task descriptions being used by the Schedule Generator.
- e. Print or suppress the printing of the Ephemeris Resource Tables.

Finally, the Data Processor was modified to accept Ephemeris Resource Tables directly from the ATS Ephemeris Tape. This permits the program to be used to plot ephemeris data exclusively or in combination with scheduling data obtained from a History Tape.


A. B. Baker

1025-ABB-li

Attachments



Reference

1. A. B. Baker
"The Automated Task Scheduler Systems Manual"
Bellcomm Technical Memorandum TM-71-1025-1
February 12, 1971.



Appendix A

Reasons For Not Scheduling a Candidate Task

A.0 Introduction

Table 3.3 lists all of the possible values of the Reason Key, along with the corresponding interpretations. The text of these interpretations is shown exactly as it is printed out by the ATS programs. The meaning of these messages is presented in the following paragraphs. As in Table 3.3, the lower case letter k and names appearing inside quotation marks are inserted for purposes of illustration. They will be replaced by actual data in the computer printout.

A.1 INSUFFICIENT AMOUNT OF CONSUMABLE 'RESNME'

An insufficient amount of Consumable RESNME (named on an Amount Card) was available to schedule the minimum number of performances specified on the task's Objective Card.

A.2 INDEPENDENT TASK 'TASKX' NOT YET CONSIDERED

The Independent Task TASKX, named on an Enable or Inhibit Card, had not been considered for scheduling when the dependent task was selected for consideration (Reference 1, Sections 4.2.1.5 and 4.2.1.6).

A.3 NO PERFORMANCES OF INDEPENDENT TASK 'TASKX'

No performances of the Independent Task TASKX, named on an Enable Card, were scheduled, and so no performance of the dependent task could be scheduled (Reference 1, Section 4.2.1.5).

A.4 MAXIMUM # OF SCHEDULABLE PERFORMANCES (k) WAS LESS THAN THE REQUIRED MINIMUM.

The maximum number of performances that could be scheduled was less than the required minimum specified on the task's Objective Card.



A.5 CREW REQUIREMENTS COULD NOT BE SATISFIED

This message indicates one of two possible errors in the task description:

- (1) The number of Resource Cards with the ANY designation in Field 3 exceeds the number of unassigned crewmen (i.e. the total number of crewmen less the number designated by specific name and skill) available, or
- (2) The task description contains a Resource Card that specifies Crewman CREWX in Field 3 and another Resource Card that specifies Skill SKILLX in Field 3. Since Crewman CREWX has been assigned Skill SKILLX, the effect is to have more than one requirement on the same resource in the same task description which is not permitted (Reference 1, Section 4.4).

A.6 NO START-TIME WINDOWS COULD BE FOUND

The Window-Finder Area could find no acceptable start-time windows for the task.

A.7 USERS CHOICE

All of the task's resource requirements, performance constraints, and performance objectives were met but the user decided not to schedule the task. This reason can only be generated by the ISG, but it may appear in printouts generated by the Schedule Generator or Data Processor programs since the History Tapes can be used as inputs to all three programs.

A.8 ZERO PERFORMANCES SPECIFIED

The number of required performances on the task's Objective Card was specified as zero.

A.9 RESOURCE 'RESNME' WAS NOT DEFINED

The alphanumeric combination RESNME does not match any of the names of the commitment tables defined for this run. The user should insure that each name specified in the third field of a Resource Card is identical to one of the names specified in the input data via Arrays NEWCOM or NEWCRW



in the NAMELIST input or via the ATS Ephemeris Tape (Reference 1, Sections 9.2.1.1 and 9.2.1.4). Note that no match will be made if the resource name defined in the input data ends with a numeral rather than a letter as required (Reference 1, Section 4.7.1.7).

A.10 CONSUMABLE 'RESNME' WAS NOT DEFINED

The alphanumeric combination RESNME does not match any of the names specified as consumables. The user should check to insure that each name specified in the third field of each Amount Card and/or each applicable Resource Card is identical to a name specified in the NAMELIST input via Array NEWDAT (Reference 1, Section 9.2.1).



Appendix B

Schedule Generator Error Diagnostics

B.0 Introduction

The error diagnostics generated by each of the ATS programs were described in the Appendix to Reference 1. The diagnostics discussed below were added to Subroutine TABIN of the Schedule Generator.

B.1 THE FOLLOWING EPHEMERIS RESOURCE TABLES WERE NOT FOUND ON THE EPHEMERIS TAPE

NAMEA

⋮

All of the alphanumeric combinations (e.g. NAMEA) listed below the message could not be matched with any of the table names on the Ephemeris Tape. The user should check to insure that each of the names is specified correctly and that a table with that name actually appears on the tape (Section 3.2.2.3).

B.2 COMMITMENT TABLE 'RESNME' ALREADY APPEARS IN ARRAY LTABLE. COMMITMENT TABLE CHAR- ACTERISTICS CANNOT BE REDEFINED

The alphanumeric combination RESNME has already been defined as a Resource or Ephemeris Commitment Table. Once defined, the characteristics (type and maximum # of table entries) cannot be changed (Section 3.2.2.4). The entry must therefore be removed from the input array in which it is defined (Array NEWCOM or EPHEM).

B.3 CREWMAN 'CREWX' ALREADY APPEARS IN ARRAY CRWSKL. CREW SKILLS CANNOT BE REDEFINED

The alphanumeric combination 'CREWX' has already been defined as a crewman and hence has already been assigned a skill. Once assigned, crew skills cannot be changed (Section 3.2.2.4). This entry must therefore be removed from input Array NEWCRW.

B.4 CONSUMABLE 'RESNME' ALREADY APPEARS IN ARRAY DTABLE. CONSUMABLE LIMITS CANNOT BE REDEFINED

The alphanumeric combination RESNME has already been defined as a consumable in Array DTABLE. Once defined, the consumable limits cannot be changed (Section 3.2.2.5). The entry must therefore be removed from input Array NEWDAT.



Subject: The Automated Task Scheduler/Version 2 - Case 610

From: A. B. Baker

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